SECTION 4

OLD AS A DINOSAUR

OUTCOME: WHAT STUDENTS WILL LEARN

- Students will understand and illustrate the components of the water cycle.

WWW.TAPPERSFUNZONE.COM

Louisville pure tap®

Core Content Standards

Science

SC-E-1.1.3 Materials can exist in different states—solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.

SC-E-2.1.1 Earth materials include solid rocks and soils, water, and the gases of the atmosphere. Minerals that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid, or gas.

SC-E-2.1.2 Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or growing the plants we use as food.

SC-E-2.3.1 The surface of the Earth changes. Some changes are due to slow processes such as erosion or weathering. Some changes are due to rapid processes such as landslides, volcanic eruptions and earthquakes.

SC-E-2.3.2 Weather changes from day to day and over seasons. Weather can be described by observations and measurable quantities such as temperature, wind direction and speed, and precipitation.

SC-M-1.3.4 The sun is a major source of energy for changes on Earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches Earth, transferring energy from the Sun to Earth.

SC-M-2.1.5 Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. Water dissolves minerals and gases and may carry them to the oceans.

SC-M-2.1.6 Earth is surrounded by a relatively think blanket of air called the atmosphere. The atmosphere is a mixture of nitrogen, oxygen and trace gases that include water vapor. The atmosphere has different properties at different elevations.

Writing

WR-E-1.3 Literary Writing

Social Studies

SS-E-4.4.1 People depend on the physical environment for food, shelter and clothing.

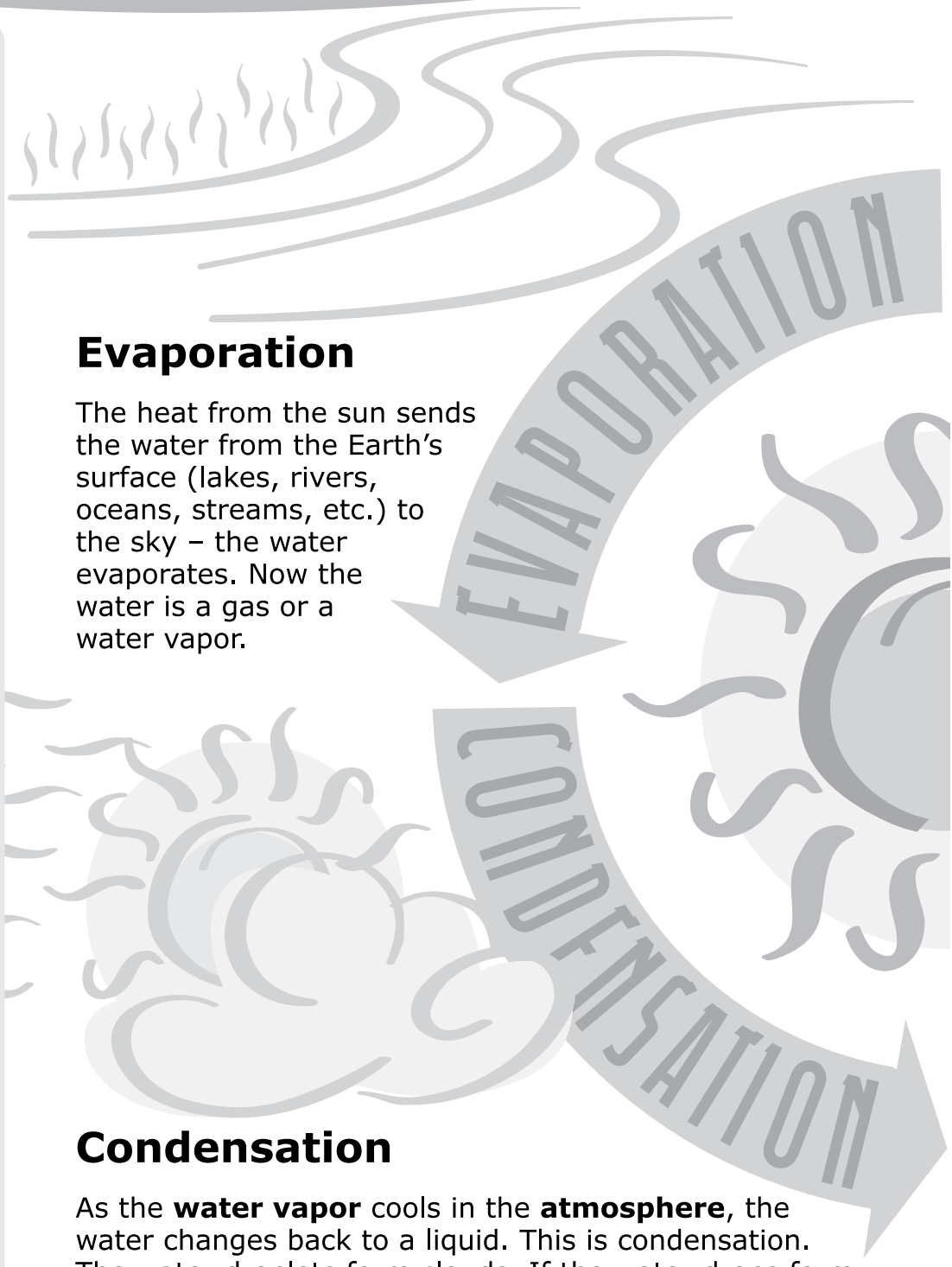
OLD AS A DINOSAUR

THE WATER CYCLE

Think of the water cycle like a big recycling program. The idea when you **recycle** is to use something over and over again. That's what we do with water. Water never stops moving, it just changes forms. The water cycle is the way the Earth uses and recycles water. Water moves from the Earth to the sky over and over again.

The sun is the driving force behind the water cycle. It takes energy to make the cycle work. There are four parts of the water cycle:

- evaporation;
- condensation;
- precipitation; and
- transpiration.



Evaporation

The heat from the sun sends the water from the Earth's surface (lakes, rivers, oceans, streams, etc.) to the sky – the water evaporates. Now the water is a gas or a water vapor.

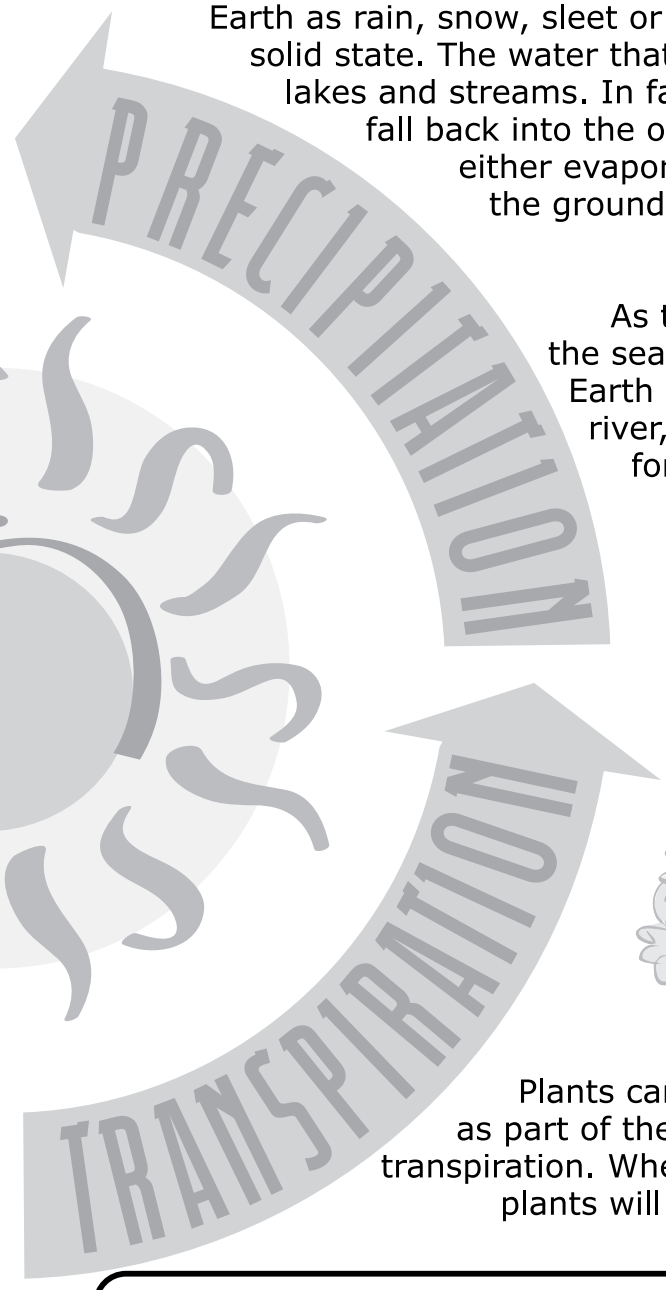
Condensation

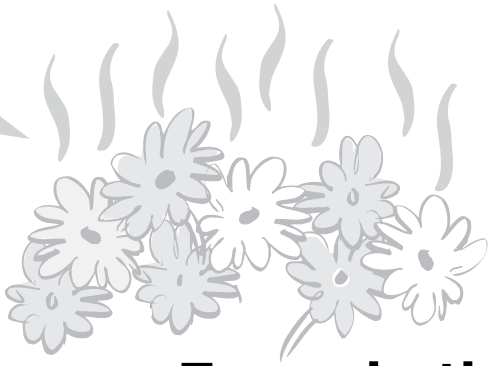
As the **water vapor** cools in the **atmosphere**, the water changes back to a liquid. This is condensation. The water droplets form clouds. If the water drops form close to the ground, that's fog. There's a lot of water vapor in the atmosphere. If all of it were to suddenly condense and fall out as rain, it would cover the entire Earth with one inch of water!

Precipitation

Depending on the weather conditions, the water falls back to Earth as rain, snow, sleet or even hail. Now the water is in a solid state. The water that falls to Earth goes into oceans, lakes and streams. In fact, 75% of the precipitation will fall back into the oceans. The rest of the water will either evaporate back to the sky or soak into the ground. People, plants and animals will use the water.

As the water makes its way back to the seas, it's also sculpting the way the Earth looks. When you really look at a river, it's never in a straight line. The force of water carves a curvy path for rivers and streams that are never a straight line.





Transpiration

Plants can also release water into the air as part of the water cycle in a process called transpiration. When water soaks into the ground, plants will use the water for nourishment.

HOW OLD IS THE WATER?

Pour a cup of water. Now take a drink. That's dinosaur water you're drinking! The water you drink today could be the same water a dinosaur drank millions of years ago. There is about the same amount of water on Earth now as when dinosaurs roamed our planet.

NOTE:

There are several activities included in this section so you can tailor the curriculum for your class.

Final Assessment Question

You get a cup of water to drink from the faucet. Explain how this could be the same water you drank a year ago.

Water Words

Atmosphere: the air above Earth.

Condensation: the change of water from a gas to a liquid.

Evaporation: the change of water from a liquid to a vapor.

Precipitation: the result of water vapors coming together. Water as a solid falls to the ground.

Recycle: to use something over and over again.

Transpiration: the loss of water from the leaves of plants.

Water cycle: the movement of water from Earth to the sky and back again, also called the hydrologic cycle.

Water vapor: water as a gas.

Louisville pure tap®

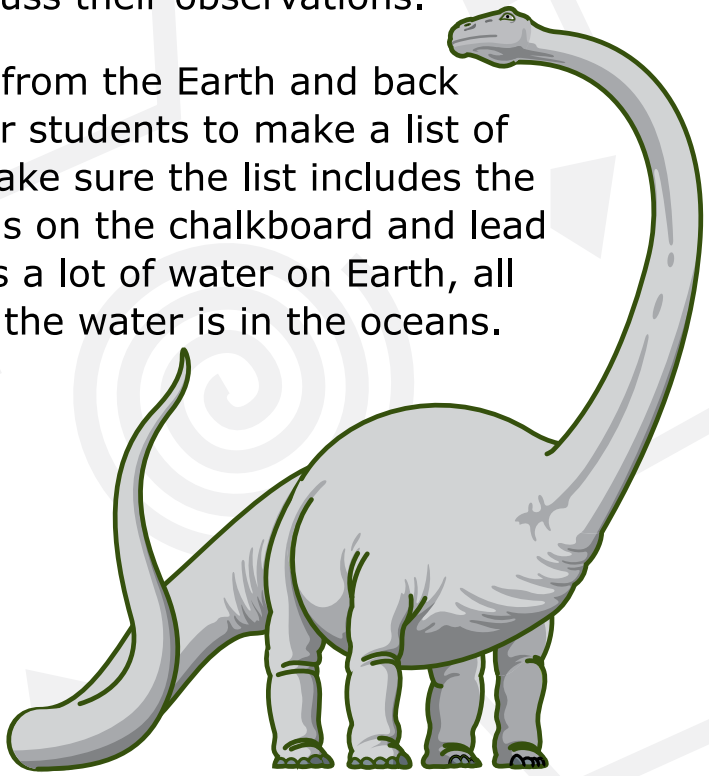
Activity #1: Starter Ideas!

Try these ideas to get students thinking about each part of the water cycle!

1. Give each student a cup of water. Ask them to take a drink. Then ask them "How old is the water?" After they brainstorm a few minutes ask if there's any way the water could possibly be as old as a dinosaur. Once they learn it's true, have the students write a story about the water in their cup. Where has it been over the years? What has it seen?

2. Take the class for a "water walk" to look for signs of the water cycle. This is best to do after it rains. You might give the students a checklist of things to look for. After the walk, discuss their observations.

3. Where is all the water that moves up from the Earth and back down from the clouds? Challenge your students to make a list of where water is found on the Earth. Make sure the list includes the three natural forms! Compile the ideas on the chalkboard and lead the class to these conclusions: there's a lot of water on Earth, all living things need water, and most of the water is in the oceans.



Have students illustrate the water cycle on paper.

Activity #2: The Disappearing Water!

EVAPORATION

Here's an easy way to get students thinking about evaporation.

Ask students to think about what happens when they go swimming. When they get out of the pool, what happens to the water on their body? What would happen if they went swimming on a cold day? Does the water evaporate more quickly? (The water evaporates more quickly on a hot day; remember the sun's heat is the driving force behind the water cycle.)

Adapted from Science Experiments and Nature Studies, Macmillian Instant Activities Program.

Objective:

Students will learn how evaporation works in the water cycle.

Time:

This experiment takes one day to set up and eight days to record the data.

You'll need:

- Masking tape
- Three jars, all the same size
- Pencil
- Water

Here's what to do...

1. Attach a strip of masking tape to the outside of each jar. You want the tape to make a straight line going from top to bottom.
2. Fill each jar full of water. It's important you put the same amount of water in each jar.
3. Use the pencil to mark the water line in each jar on the masking tape.
4. Place one jar in a warm spot (near a heater or in the sun). Place another jar in a cold spot (in the shade). Put the other jar in a spot where it's room temperature.
5. Check the water level in the jars for the next eight days. Make a pencil mark on the tape to show the level of the water each day.
6. Record what happens on the activity sheet provided.

Think about it!

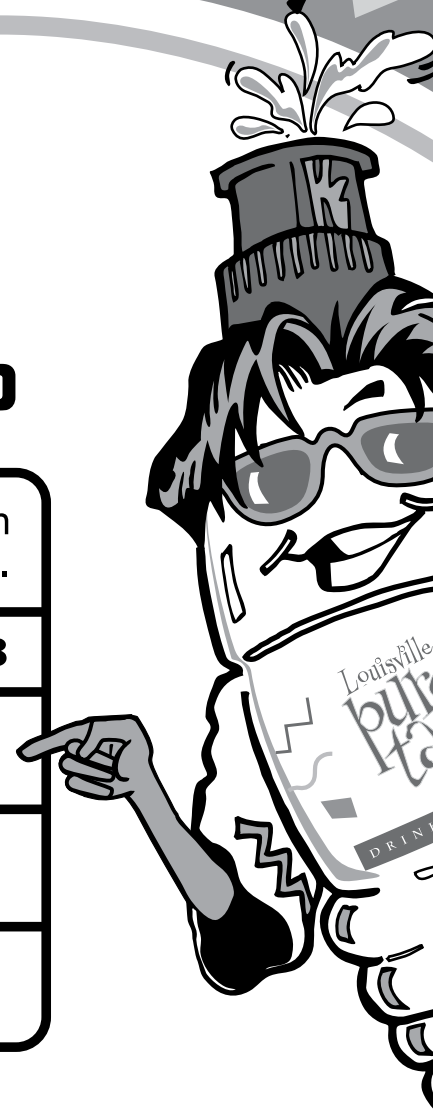
In which jar did the most water disappear?

(It should be the jar you placed in the sun, reinforcing the heat factor in the water cycle.)

What happened to the water that disappeared?

(It evaporated into the sky to eventually condensate and fall back to Earth.)

Activity #2: The Disappearing Water!



Where's The Water Line?

Each day write down what happened to the water line on each jar. Write if the line moved up or down or not at all.

Day	1	2	3	4	5	6	7	8
Warm Jar								
Cold Jar								
Jar at room temperature								

From which jar did the most water disappear? _____

Why did this jar have the most water disappear? _____

_____

What happened to the water that disappeared? _____

_____

_____

Worksheet

Activity #3: The Big Glass Bowl

Objective:

Students learn how evaporation and condensation work in the water cycle.

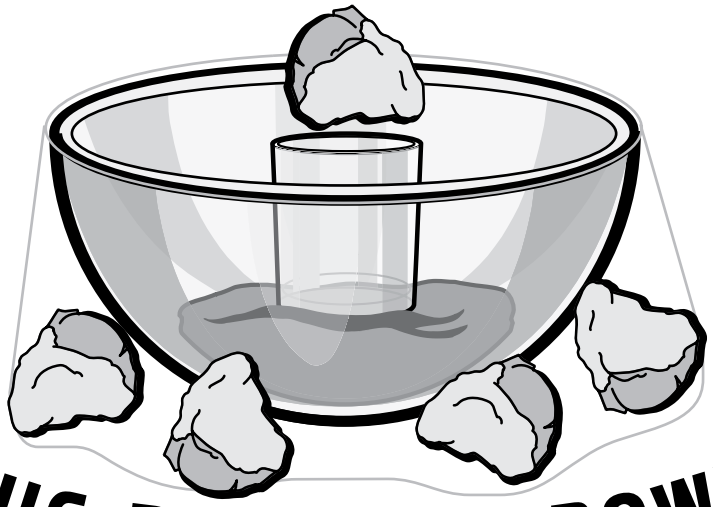
Time:

3-4 hours to complete the experiment.

You'll need:

- 4 cups of dirt or sand
- About a dozen rocks (not small ones)
- 2 quarts of water
- Large glass bowl with tall sides (mixing bowl will work)
- Short glass
- Clear plastic wrap
- Sunny day

EVAPORATION AND CONDENSATION IN THE BIG GLASS BOWL



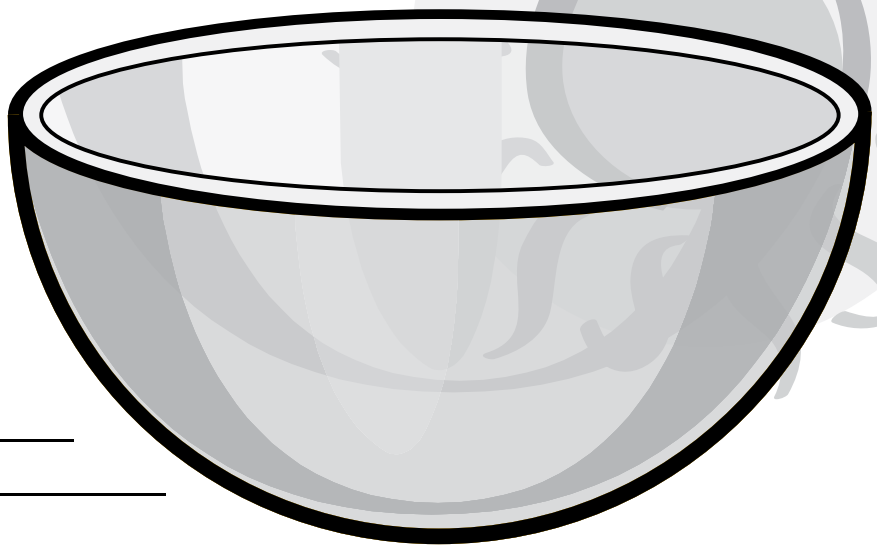
Here's what to do...

1. Mix the dirt or sand and water in the bowl.
2. Stand a clean and empty short glass in the center of the bowl.
3. Place the bowl outside in the sun. Cover the bowl with the plastic wrap and weigh down the edges with the remaining rocks.
4. Place one rock on the plastic wrap directly over the cup.
5. Allow the bowl to remain in the sun for several hours.

Look in the cup (it should contain some relatively clean water free of mud).

Look in the bowl (it should contain dried dirt).

Activity #3: The Big Glass Bowl



1. What two water cycle processes did you see in this experiment?

_____

_____

2. Why did you have to sit the bowl in the sun?

_____

_____

3. What did the plastic wrap represent? _____

4. Where did you see condensation? _____

5. Why were the water drops in the cup clear and not muddy?

_____

_____

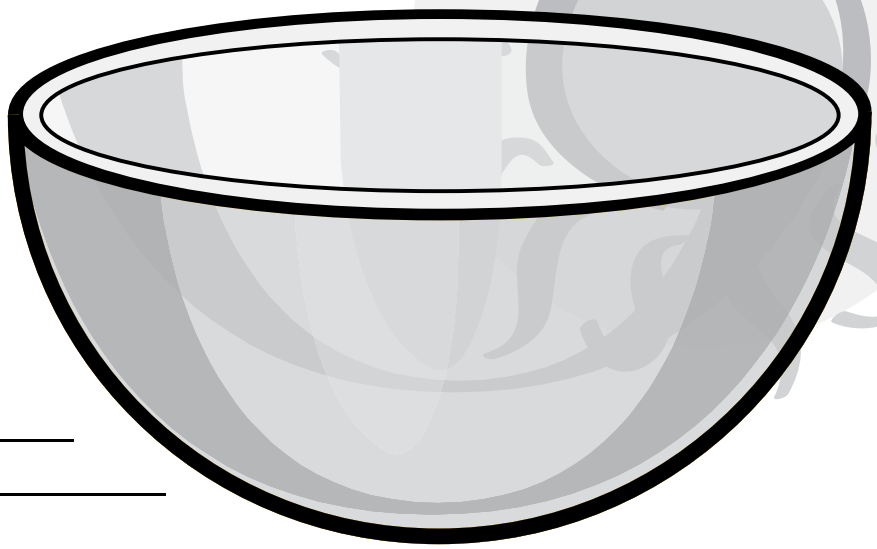
_____

_____

_____

WORKSHEET

Activity #3: The Big Glass Bowl



1. What two water cycle processes did you see in this experiment?

Evaporation & condensation

2. Why did you have to sit the bowl in the sun?

Sun is the driving force to make the water evaporate – sun is the driving force in the water cycle.

3. What did the plastic wrap represent? *The atmosphere*

4. Where did you see condensation? *Inside the cup*

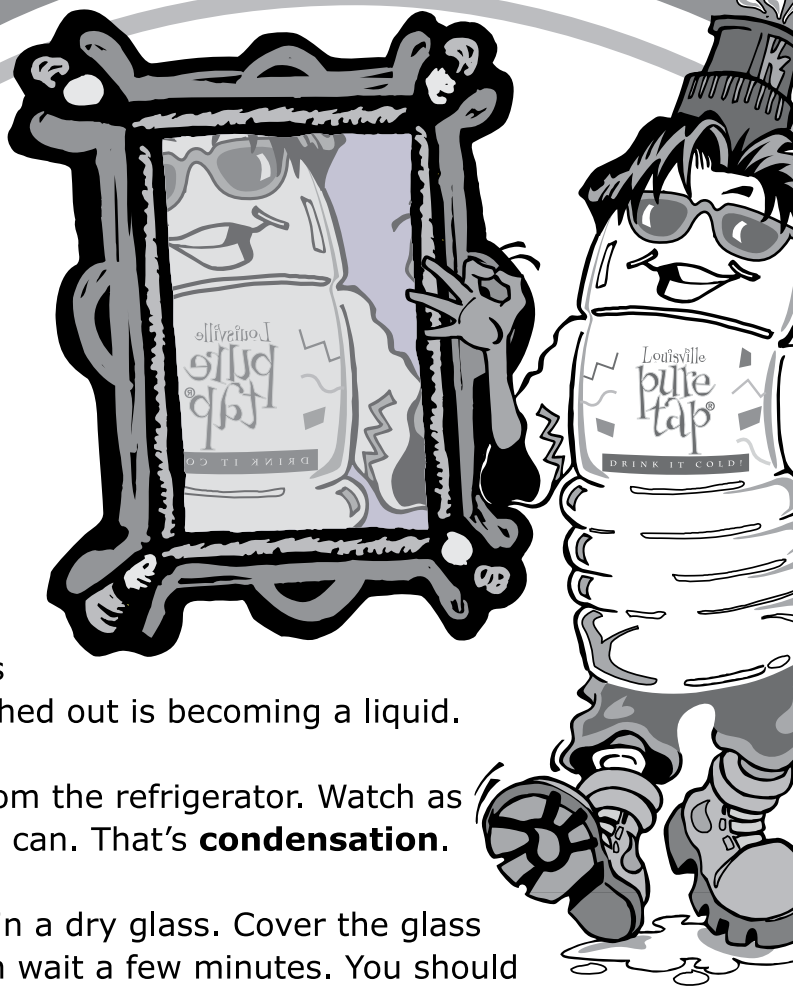
5. Why were the water drops in the cup clear and not muddy?

The water cycle can help purify water. When the water evaporates the mud is left behind and the water becomes a vapor. Then as condensation occurs the water becomes a liquid again.

ANSWERS

WORKSHEET

Activity #4: Condensation and Precipitation

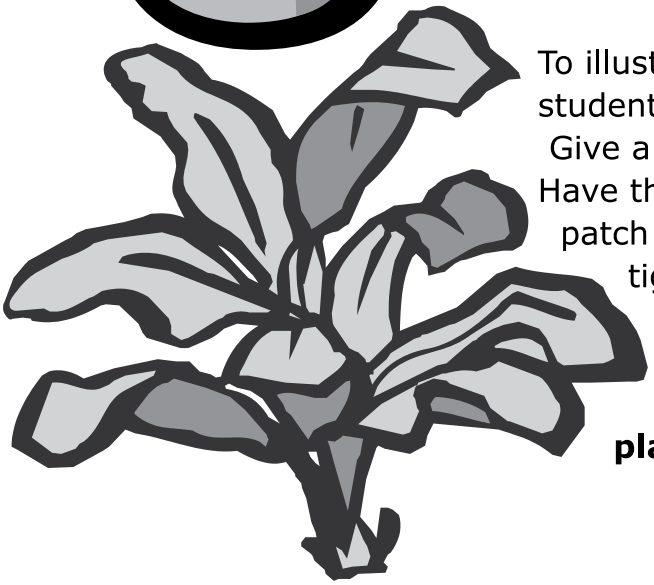


Here are some easy ways to illustrate condensation, precipitation and transpiration.

Have students hold their hand in front of their mouth. Then breathe onto your hand at least five times. What do you feel on your hand? Moisture! You can also see this when you breathe onto a mirror. Watch as water droplets form on the mirror. The water vapor you breathed out is becoming a liquid.

Bring a cold soda can from the refrigerator. Watch as water drops form on the can. That's **condensation**.

Place some crushed ice in a dry glass. Cover the glass with thin cardboard then wait a few minutes. You should see the outside of the glass become misty and tiny drops of water appear. What happened was the ice cooled the glass, the warm air in the glass was cooled, and the water vapor inside the glass changed to water drops. **What would happen if you put the ice in a cold cup instead of a dry one?**



To illustrate **transpiration** take students outside to a grassy area. Give a few students clear plastic cups. Have the students place the cups over a patch of the grass. Hold the cups down tightly. Time how long it takes for moisture to form on the inside of the cup. Where's the water coming from in the glass? **(From the plants, this is transpiration.)**

Activity #5A: Water Cycle in a Jar

Adapted from Massachusetts Water Resource Authority.

For best results, start this experiment at the begining of class.

Objective:

Students will learn how the water cycle works.

Time: Fifteen minutes for set-up. Another 15-30 minutes to see results.

You'll need:

- An empty clear jar or two liter plastic soda bottle (with cap)
- Food coloring
- Sunny window or lamp
- Cup of water

Here's what to do...

1. Mix together food coloring and a cup of water.
2. Pour one inch of colored water into the jar.
3. Screw the cap on the jar.
4. Place the jar in a sunny area.
5. Watch what happens!

The sunny area represents the heat required for the water cycle and evaporates the water. You should see water droplets collect on the side of the jar (condensation). Food coloring helps to see the process more clearly. If the jar sits long enough, some of the water droplets will fall back into the water (precipitation).

Think about it!

What collected on the side of the jar?
Did all of the water evaporate?
What does this model represent?

WORKSHEET

Write about how the water cycle can be compared to a recycling program.

_____

_____

_____

_____

_____

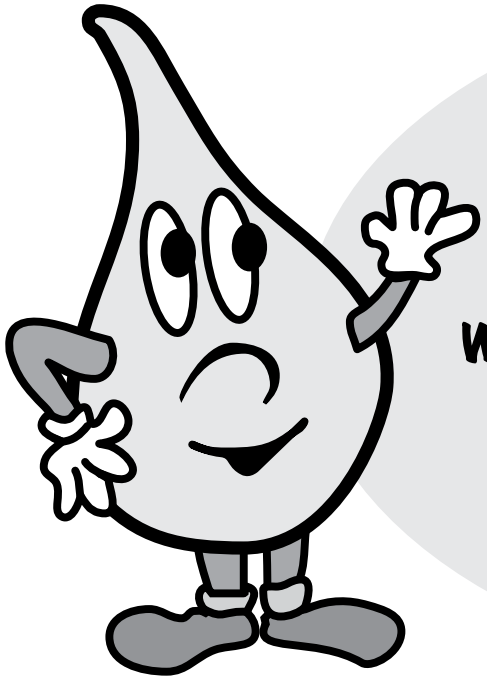
Fill in the blanks with the water cycle word!

1. _____ is when the sun's heat turns water into a gas.

2. When water changes back to a liquid in the atmosphere, it's called _____.

3. Water falls back to Earth as rain, snow, sleet or hail in _____.

4. _____ occurs when plants release water into the air.



If it's possible to drink water as old as a dinosaur, that means every drop of water has lived an exciting life!

Write a story about the life of a water drop.

Where did it go?

What did it see?

Worksheet Answers

Write about how the water cycle can be compared to a recycling program.

Answers should reflect how we use the same water over and over.

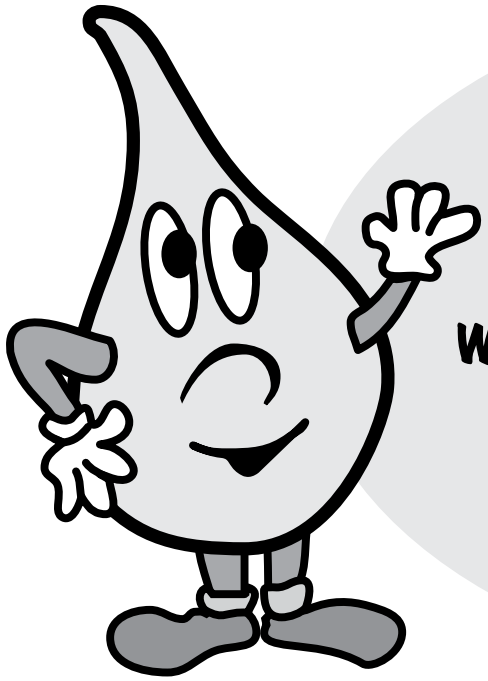
Fill in the blanks with the water cycle word!

1. *Evaporation* is when the sun's heat turns water into a gas.

2. When water changes back to a liquid in the atmosphere, it's called *condensation*.

3. Water falls back to Earth as rain, snow, sleet or hail in *precipitation*.

4. *Transpiration* occurs when plants release water into the air.



If it's possible to drink water as old as a dinosaur, that means every drop of water has lived an exciting life!

Write a story about the life of a water drop.

Where did it go?

What did it see?

Open Response Question

Water covers most of the Earth. We use the same water over and over again in the water cycle.

A. Draw and label each part of the water cycle.

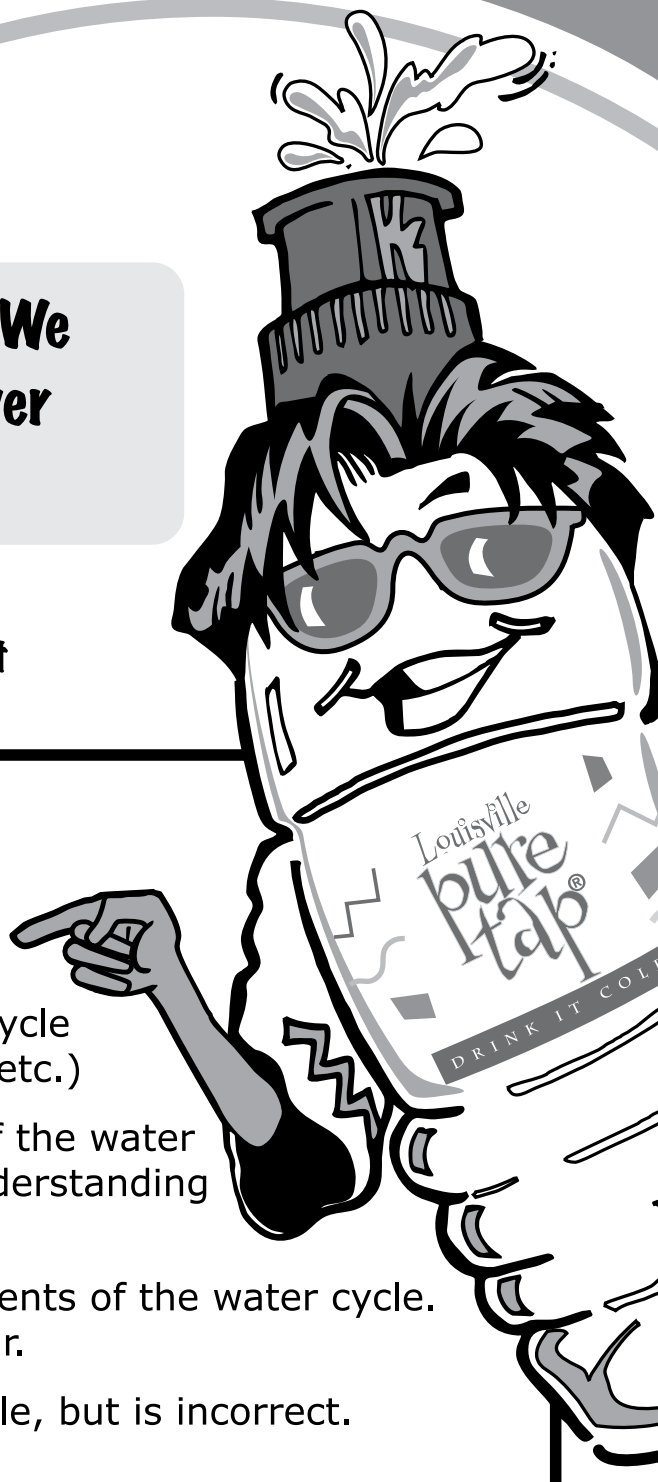
B. Describe two ways that the weather might affect different parts of the water cycle.

Open Response Question

Water covers most of the Earth. We use the same water over and over again in the water cycle.

A. Draw and label each part of the water cycle.

B. Describe two ways that the weather might affect different parts of the water cycle.



Scoring Guide

4–Student correctly identifies each part of the water cycle and response includes at least two ways weather might affect the cycle (drought, cloudy days, desert conditions, etc.)

3–Student correctly identifies components of the water cycle in the drawing, but has a limited understanding of the impact of weather.

2–Student attempts to illustrate the components of the water cycle. Response as to weather's impact is unclear.

1–Student attempts to explain the water cycle, but is incorrect. Response shows minimal understanding.

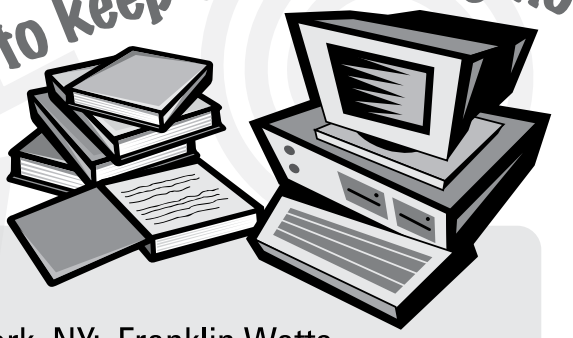
0–No attempt or relevant answer.

Look for:

- Evaporation, condensation, precipitation and transpiration labeled.
- Sun is the driving force in water cycle-heat affects evaporation.
- Lack of precipitation can happen during hot, dry months.

Old As A Dinosaur

Check out these opportunities to keep the learning flowing!



Extra, Extra!!

Books:

Ardley, N. (1983). *Working with water.* New York, NY: Franklin Watts. *Various experiments.*

Cole, J. (1990) *The magic school bus; Wet All Over.* New York, NY: Scholastic Inc.

Jevnesse, G., Valet, P. (1990) *Water.* New York, NY: Scholastic Inc. *Children's story about the water cycle.*

Greenaway, T. (2001). *The water cycle.* Austin, TX: Raintree Steck-Vaughn. *Good teacher resource.*

Maynard, C. (1997). *Why are there waves?* New York, NY: DK Publishing. *Children answer a series of questions about water and its properties.*

Web sites:

www.epa.gov/water/kids/waterforkids.html *Information, projects, materials and games.*

www.quia.com/jg/62.html *Matching games and flash cards on the states of water and the water cycle.*

Louisville Water Company Opportunities:

Call the Public Information Office at 569-3600 to schedule water experiments in your classroom. LWC will come to you for water fun!
www.tappersfunzone.com *Click on "Teacher Tools" for a supplement to this section.*